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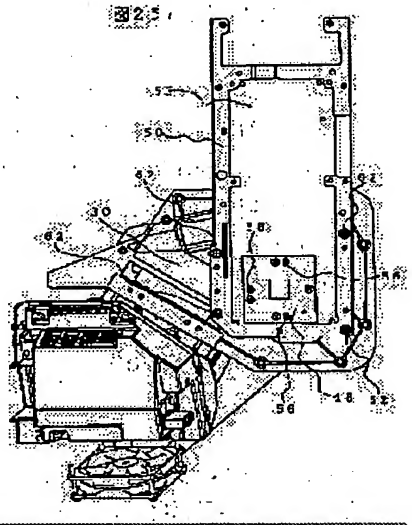
(54) DISPLAY OPTICAL UNIT AND DISPLAY DEVICE USING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To decrease excess stress added to the fixing part of a display element in a display device due to the increased size and weight of the driving circuit of the display element.

SOLUTION: In the display device equipped with a screen where the light emitting from a display optical unit is projected on the back face and data is displayed in the front face, the display optical unit has a substrate to mount the display element and has the fixing member to fix the substrate to the display optical unit. The display unit is directly positioned and fixed to the display optical unit.



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CLAIMS

[Claim(s)]
[Claim 1] The light source system which has the light source, the illumination system which irradiates the light from this light source system, and the display device which controls and carries out outgoing radiation of the light irradiated from this illumination system, The substrate which is the display optical unit which has the projection system which projects the light from said display device, and **** said display device, Have the holddown member which fixes this substrate to said display optical unit, and positioning immobilization of said substrate is carried out in the location estranged from said display device at said holddown member. Said holddown member is a display optical unit characterized by being constituted so that it may be fixed to said display optical unit in the location close to said display device.
[Claim 2] Said substrate and said holddown member are a display optical unit according to claim 1 characterized by having an expansion coefficient to the heat of an abbreviation EQC.
[Claim 3] Said substrate is a display optical unit given in any of claim 1 which is sheet metal-like and is characterized by having predetermined flexibility in the thickness direction thru/or claim 2 they are.
[Claim 4] The display characterized by having a display optical unit given in any of claim 1 thru/or claim 3 they are, and the screen which projects the light on which it was projected from this display optical unit, and displays data.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to displays, such as a projection mold display unit which irradiates light at a display device and projects the light from a display device on a screen etc. from the light source.
[0002]
[Description of the Prior Art] It is usually more advantageous than the display unit using a direct viewing type display device at the point that the image of a big screen can be acquired from before with the combination of a display device with a comparatively small projection mold display unit, and the

expansion projection system.
[0003] That is, a projection mold display unit is equipped with the display optical unit which expands greatly the light controlled corresponding to the input data by dozens times, and usually projects it on them while it carries out incidence of the light from the light source to a comparatively small display device.
[0004] As this kind of equipment, the thing of a publication is, for example in JP,2000-88703,A.
[0005]
[Problem(s) to be Solved by the Invention] It is the description for the display optical unit in a display to irradiate light at a comparatively small display device, to carry out expansion projection of this at a screen etc., and to obtain a big screen.
[0006] In order to project these big screens on right locations, such as a screen, by high definition, it is important that a display device, the projection system, and a screen are in right physical relationship mutually. Especially when the dilation ratio by the projection system is large as mentioned above, the location precision of a display device and the projection system is important. That is, if a display device becomes small, the dilation ratio of the projection system to a screen will become large relatively, and on a screen, a location gap of some of display devices and projection system serves as gross errors, and will appear. Therefore, in order to display data correctly on a screen, it is required to secure the physical relationship of a display device and the projection system correctly first.
[0007] On the other hand, the display device section and the drive circuit section were constituted separately, and the conventional display device has combined the meantime electrically with the flexible wire rod. Moreover, since [small] it is light, the display device section has the relatively common method directly fixed using holddown members, such as predetermined metallic ornaments. However, since it progressed in recent years with high-performance-izing of the display image by increase of the number of pixels, high-frequency-izing of clock frequency, etc., high-frequency-izing, and enlargement, i.e., weight-izing, of a drive circuit, a wire rod etc. did not need to be used but the display device section and a drive circuit needed to be coupled directly with the substrate.
[0008] Therefore, it is necessary for highly precise positioning to fix the required display device section and the drive circuit section which are a big configuration and weight relatively to the pedestal which is the case of a display optical unit in one.
[0009] However, generally the base material consists of a ceramic and a plastic, and the attachment frame of a display device is constituted from the above-mentioned conventional example by the plastic. Since the rigidity or reinforcement is comparatively low, it breaks, or it tends to receive deformation etc., and cannot fix it to a pedestal etc. by the not much big force according to **** etc. Moreover, if a big substrate is held in the small display device section as usual, the display device section will be joined by the excessive moment and all cannot be relatively fixed to a pedestal etc. in the small display device section as a result including the circuit board which has big mass and area relatively.
[0010] On the other hand, generally a pedestal is constituted from the height of the degree of freedom of the configuration by the ingredient of a plastic or dies casting. Namely, as for the circuit board, configuration materials completely differ. Therefore, properties with thermal pedestal ingredient and circuit board ingredient differ inevitably, and especially coefficient of linear expansion differs greatly. Therefore, if these display device section and the drive circuit section are fixed to a pedestal in one, according to environmental change, i.e., temperature change, a difference will arise in the amount of dimensional changes by the difference in a mutual coefficient of linear expansion of a pedestal and the circuit board.
[0011] Therefore, fixing the circuit board containing the display device section to a pedestal directly will generate a location gap of the display device section to the optical system constituted by the pedestal as a result. The purpose of this invention cancels the trouble of the above-mentioned conventional technique, and is to offer the display which can reduce location change with a display device and the projection system by environmental change.

[0012]
[Means for Solving the Problem] For said purpose achievement, in invention of the 1st of this invention The light source system which has the light source, the illumination system which irradiates the light from this light source system, and the display device which controls and carries out outgoing radiation of the light irradiated from this illumination system, The substrate which is a display using the display optical unit and it which have the projection system which projects the light from said display device, and **** said display device, It has the holddown member which fixes this substrate to said display optical unit, and positioning immobilization of said substrate is carried out in the location estranged from said display device at said holddown member, and said holddown member is constituted so that it may be fixed to said display optical unit in the location close to said display device.
[0013] In the 2nd invention, as said substrate and said holddown member have the coefficient of thermal expansion of an abbreviation EQC, they maintain the location precision of a display optical unit and a display device, and they secure the location precision of a projection image as a result.
[0014] In the 3rd invention, as it has predetermined flexibility in the thickness direction by making said substrate into the shape of sheet metal, it is made for the unnecessary force not to work to a display device, and the location precision of a projection image is secured.
[0015]
[Embodiment of the Invention] Hereafter, this invention is explained using a drawing.
[0016] Drawing 1 – drawing 6 are the general drawing of the display for explaining this invention.
[0017] The plan of a display 20 and drawing 5 of the front view of a display 20 and drawing 3 are the side elevations of a display 20, and drawing 1 shows a general view of the whole equipment. In drawing, 1 shows a case and 2 shows a screen. With the gestalt of this operation, a display 20 is the description with big the dimension below a screen 2 being very small. Moreover, the part of the case 1 of the outside of a screen 2 is very thin, and while being the design felt very refreshed as a whole, the magnitude of a display 20 becomes settled with the magnitude of a screen 2 substantially. On the other hand, since the field of the light on which it is projected on a screen is limited to the part of the outer frame of a screen, in order to make it not missing [the light on a screen], it is necessary to secure the location precision of the light on which it is projected. Furthermore, as shown in drawing 3 , the display 20 serves as a configuration narrowed down greatly in the depth direction, and is convenient for the installation to a corner etc.
[0018] Drawing 2 is [the plan of a display 20 and drawing 6 of the front view of a display 20 and drawing 4] the side elevations of a display 20, and especially 4 shows a reflective mirror and shows the optical path from the display optical unit 3 mentioned later to a screen 2 through the reflective mirror 4 by the broken-line arrow head. the reflective mirror 4 — the depth direction of a case 1 — comparatively — alike — the backside — and it is arranged aslant in the upper part and the predetermined incident light way shown in drawing 2 and drawing 6 by the broken-line arrow head is obtained. Since the reflective mirror 4 is arranged in the depth direction as mentioned above at the backside, it can arrange to the backside relatively [mirror / 4 / reflective / the display optical unit 3 which irradiates light from a lower part]. Moreover, since the projection system which results in the reflective mirror 4, and the reflective system from the reflective mirror 4 to a screen 2 serve as space of abbreviation identitas from the display optical unit 3 as shown in drawing 6 , it is the backside and the display optical unit 3 can be relatively arranged to the up side. Therefore, the dimension of the screen bottom can be reduced and a display 20 can be miniaturized especially in the height direction as a result.
[0019] The plan of a display 20 and drawing 9 are the side elevations of a display 20, the front view of a display 20 and drawing 8 cut some cases 1, and drawing 7 lacks them, and is illustrating arrangement of the internal display optical unit 3. 5 of drawing 9 is the light source system of the display optical unit 3. The light on which it was projected by the display optical unit 3 from the lower part in the abbreviation upper part changes the sense into an abbreviation horizontal direction by the reflective mirror 4 aslant installed in the backside of a case 1, and it is projected on it by the screen 2 from a tooth back. As

height relation is shown in drawing 7 and drawing 9 , the lower limit of the display optical unit 3 carries out abbreviation coincidence with the lower limit of a case 1, and near the center of the display optical unit 3 carries out abbreviation coincidence with the lower limit of a screen 2. Moreover, in the depth direction, the light source system 5 in the display optical unit 3 is arranged at the backside of a case 1. Therefore, the effectiveness and the interval which were explained by drawing 6 can attain the large miniaturization of a display.

[0020] Furthermore, drawing 13 shows the front view of the display optical unit 3, and drawing 14 shows the plan of the display optical unit 3. In 5, a light source system and 9 show an illumination system, and 19 shows the projection system. Moreover, 30 shows a pedestal and carries the light source system 5, an illumination system 9, and the projection system 19. As shown in drawing 13 , each of the light source system 5, an illumination system 9, and the projection system 19 is in abbreviation etc. by carrying out, has a height relation, and is using the overall dimension of the display optical unit 3 as the compact. Moreover, as shown in drawing 14 , the light source system 5 is arranged at the backside of equipment, the projection system 19 is arranged from relation with the reflective mirror 4 in the central neighborhood of equipment, and an illumination system 9 is further arranged so that the upper limit of the light source system 5 and the lower limit of the projection system 19 may be connected aslant. According to the gestalt of this operation, since it is in the backside of equipment, and the light source system 5 can carry out direct access from the equipment exterior, exchange of the light source is very easy the system.

[0021] As mentioned above, the display optical unit 3 can use the height, depth, and breadth of itself as a compact enough, and can avoid and arrange the optical path (a broken line shows to drawing 6) from the reflective mirror 4 to a screen 2. That is, the lower limit of the optical path to a screen 2 from the reflective mirror 4 is slanting as shown in drawing 6 , and the allowances of the height direction will produce the backside of equipment to the optical-path down side.

[0022] Since the display optical unit 3 is directly under the reflective mirror 4 in the height direction and is arranged with the gestalt of this operation at the backside of the equipment depth direction, the display optical unit 3 can be arranged in the highest location within limits which do not interrupt the incident light to a screen 2 inside a display 20, and the dimension protruded from the lower limit of a screen 2 as shown in drawing 7 is reduced greatly. Therefore, from a screen 2, a downward dimension is small and a case 1 can use the whole equipment as a compact extremely.

[0023] Moreover, since the display optical unit 3 is arranged at the backside of equipment, the reflective mirror 4 is in the backside in the depth direction of a case 1. Therefore, the reflective mirror 4 could reduce the area of a reflective mirror, and has contributed to small lightweight-ization of equipment greatly while distance with a screen 2 was secured and it has prevented degradation of the image quality engine performance by the reflected light for which it is not asked from a screen.

[0024] Drawing 10 - drawing 12 are the components plot plans in the display optical unit 3 for explaining this invention. Drawing 10 is [a plan and drawing 12 of a front view and drawing 11] side elevations.

[0025] 5 shows a light source system. 6 holds the bulb (not shown) which is the Maine reflector and is a source of luminescence inside. With the gestalt of this operation, since light is condensed to the light pipe 13 mentioned later, the cross section is made elliptical. That is, a bulb is arranged in the location which carried out abbreviation coincidence at the 1st focus of the Maine reflector 6, and it is arranged so that near incidence opening of a light pipe 13 may carry out abbreviation coincidence at the 2nd focus. Moreover, as for a cross section, it is natural that various kinds of configurations, such as the shape of a parabola, can be considered depending on combination with an illumination system. 7 is a subreflector and raises the efficiency for light utilization of the light source. After the display 20 in the gestalt of this operation has ****(ed), the Maine reflector 6 side is turned down, it is arranged, and outgoing radiation of the light is carried out to the abbreviation upper part. Thus, forming the display optical unit 3 in a compact, since the location of the 1st focus is most kept away from an illumination system and can be arranged, without changing the magnitude of the display optical unit 3, the specified

quantity reservation of the distance from a bulb and a light source system, i.e., the 1st focus, to the 2nd focus is carried out, the condensing nature of the light to a light pipe 13 is raised as a result, and the efficiency for light utilization in an illumination system 9 is improved.

[0026] 8 is a reflective mirror, and it bends the outgoing radiation light from the light source system 5 90 abbreviation or more, and it is made it to carry out incidence to an illumination system 9. An illumination system 9 is aslant arranged as a whole by bending of the reflective mirror 8, incidence is carried out from the upper part, and light is drawn caudad. Moreover, it is reducing that the film which makes fields other than the light of ultraviolet rays and infrared radiation absorb or penetrate is formed, an unnecessary light carries out incidence of the reflective mirror 8 to an illumination system 9, and the evil by heat generates it. Moreover, since incidence of the light which turned outgoing radiation upward is altogether carried out to an illumination system 9 by the reflective mirror and light is irradiated downward by the illumination system 9 from the light source system 5, it decreases that leakage light affects the screen 2 of the front face of equipment.

[0027] Furthermore, since the reflective mirror 8 is arranged between the 1st focus of the Maine reflector 6, and the 2nd focus, it is contributing to securing the distance of the 1st focus and the 2nd focus, without enlarging magnitude of the display optical unit 3.

[0028] 10 is a color disk and consists of a motor 11 and a color filter 12. A color filter 12 consists of each segment corresponding to a RGB color, and separates a color in time sharing by rotation of a motor 11. 13 equalizes spatially and carries out outgoing radiation of the light by which is a light pipe and color division was carried out with the color filter 12. 14 and 15 are illumination system lenses, and are a predetermined dilation ratio to a display device 18 about the outgoing radiation light from a light pipe 13, and amend and irradiate aberration. As a light pipe, an inside can consider the type of a reflector, and the type of a solid by hollow. When the illumination system 9 has the function of separation of a color, a scale factor, and aberration amendment as mentioned above and it is configurated aslant, the height direction dimension is the height dimension and abbreviation EQC of the light source system 5. Moreover, a lateral dimension is not unnecessarily enlarged by constituting aslant. Thereby, the height dimension and longitudinal direction dimension of the display optical unit 3 do not become large unnecessarily.

[0029] 16 is a reflective mirror, and it bends the outgoing radiation light from the illumination system lens 15, and it is made it to carry out incidence to prism 17 from a side face. Incidence of the light which carried out incidence to prism 17 is carried out to the display device 18 which was bent in the internal reflector and has been arranged under the prism 17. A display device 18 is located in the lowest edge of the display optical unit 3, and is in height relation equivalent to the lowest edge of the above-mentioned light source system 5. Since a display device 18 is in the lowest edge, it is rare thermal to be influenced by other factors inside equipment, and it can make a cooler style easy. furthermore — since an illumination system 9 is constituted aslant — the distance of a display device 18 and the light source system 5 — specified quantity **** — since things are made, the display device 18 has stopped easily being thermal influenced of the light source system 5 Therefore, since cooling device ****** can maintain the temperature of a display device 18 low while tending to attain small lightweight-ization of a display 20, it can make the engine performance of a display device 18 stable, and can secure high dependability.

[0030] In the gestalt of this operation, a display device 18 is a reflective mold and LCD, DMD (digital micro mirror device), etc. are used. Incidence of the light reflected by the display device 18 is again carried out to prism 17, and only a desired light carries out incidence to the projection system 19. Moreover, from the projection system 19, light carries out outgoing radiation to the abbreviation upper part toward the reflective mirror 4. The height direction dimension is the light source system 5 and an abbreviation EQC, and the projection system 19 does not expand the height dimension of the display optical unit 3 unnecessarily as a result.

[0031] A display optical unit can be made compact by constituting a light source system, an illumination

system, and the projection system as mentioned above, and using a display device as a reflective mold.
[0032] Next, drawing 15 – drawing 24 explain the projection system and an adjustment device.
[0033] Drawing 15 is a side elevation showing the projection system which includes a cross section in part. Direct positioning immobilization of the display device 18 is carried out in the lower limit of the pedestal 30 which constitutes the display optical unit 3. Moreover, prism 17 holds position relation with a display device 18 to the display device 18 up side, and is fixed to it. A display device 18 can maintain correctly physical relationship with the light source system 5 and illumination system 9 which were mentioned above by that by which the various optics which constitute the light source system 5 and an illumination system 9 are carried in a pedestal 30 on the other hand (shown in drawing 13 and drawing 14).
[0034] On the other hand, the projection system 19 is carried in the pedestal 30 bottom through the adjustment device mentioned later. The adjustment device consists of a plate 31, adjusting cams 32 and 52, and a flange 33. A plate 31 is fixed to a pedestal 30 with a screw (not shown) etc., and the lens-barrel 34 of a projector lens is directly fixed to a flange 33. Moreover, a flange 33 is fixed to a pedestal 30 with a screw (not shown) etc. through a plate 31. Therefore, the outgoing radiation of the light which carried out incidence to prism 17 from left-hand side toward the drawing in drawing 15 is turned down according to an optical operation of prism 17, and it carries out incidence to a display device 18. Furthermore, incidence of the light reflected by the display device 18 is again carried out to prism 17, in drawing 15 , outgoing radiation of the light on which it should be projected by the screen 2 is carried out to the upper part, and it carries out incidence to the projection system 19. Therefore, in accordance with an optical axis (method of drawing very best) common to a display device 18, prism 17, and the projection system 19, outgoing radiation of the light on which it is projected by the screen 2 is carried out. the projection system [as opposed to a display device 18 or prism 17 by making the location of the projection system 19 adjustable in a perpendicular field to said common optical axis here] 19 — a right location — or the projection system 19 can be adjusted to a right location to a screen 2.
[0035] With the gestalt of this operation, the height of the projection system 19, i.e., the height of a flange 33, becomes settled with a pedestal 30 and a plate 31, and it is not influenced of adjusting cams 32 and 52.
[0036] Drawing 16 is the decomposition perspective view of the projection system 19 and an adjustment device. On a plate 31, two support pins 35 and 55 stand erect, and it is arranged with the gestalt of this operation in the location in alignment with the longitudinal direction (namely, setting to drawing 11 longitudinal direction) of the effective rectangle area of a display device 18. The adjustment actuation corresponding to the upper and lower sides of a projection location to a screen or a gap of a longitudinal direction is possible so that adjusting cams 32 and 52 may be inserted in said support pins 35 and 55 and it may mention later by rotation actuation of these adjusting cams 32 and 52.
[0037] The hole which carries out checking and verifying to the support pins 35 and 55 is established in the interior, and adjusting cams 32 and 52 are supported for the surroundings of the support pins 35 and 55, enabling free rotation. Two kinds of cams 37 and 38 change height into the periphery section of an adjusting cam 32, and are prepared in the location which carried out eccentricity to the above-mentioned hole at it. Moreover, two kinds of cams 57 and 58 change height into the location which carried out eccentricity to the periphery section of an adjusting cam 52 to the above-mentioned hole similarly, and are prepared in it. Furthermore, the above-mentioned hole and the bodies 39 and 59 of the same axle are formed in the topmost part. A flange 33 is respectively inserted in the cam 37 of said adjusting cam 32, 38 or a body 39 and the cam 57 of said adjusting cam 52, 58, or a body 59. Although the lens-barrel 34 is not illustrated, it has two or more lens groups inside, and it is fixed to a flange 33. Moreover, after a flange 33 ends adjustment, although not illustrated, it is fixed to a pedestal 30 with a plate 31 with a screw etc. Moreover, a spring 36 is formed in the edge at a plate 31, and a spring 36 presses a flange 33 in the predetermined direction. Thereby, shakiness by the path clearance of the support pins 35 and 55 and adjusting cams 32 and 52 or the path clearance of adjusting cams 32 and 52

and a flange 33 is absorbed at the time of adjustment of the projection system 19, and tuning is made stable.

[0038] Drawing 17 shows the condition of having carried adjusting cams 32 and 52 to a plate 31, and shows a design condition fundamentally. Therefore, the optical-axis core of the projection system 19 (a two-dot chain line shows at drawing 17 .) comes on segment A-A which connects the core of the support pins 35 and 55 of a plate 31.

[0039] next, the detail of the positioning relation between adjusting cams 32 and 52 and a flange 33 — a B-B cross section is shown in drawing 18 , and an A-A cross section is shown in drawing 28 and drawing 29 about a C-C cross section at drawing 19 .

[0040] First, an adjusting cam 52 is explained using drawing 28 and drawing 18 . The hole prepared inside is inserted in the support pin 55, and an adjusting cam 52 is held free [rotation].

[0041] On the other hand, although the cam 57 prepared in the periphery of an adjusting cam 52 is formed in the location which carried out eccentricity to the center of rotation of an adjusting cam 52, it contacts the inside side of a flange 33. That is, a cam 57 and the flange 33 of each other are not positioned.

[0042] Furthermore, a cam 58 is formed so that eccentricity may be carried out in the direction which is different in the above-mentioned cam 57 to the center of rotation of an adjusting cam 52, and in the direction of an A-A cross section, as shown in drawing 28 , the outer diameter of a cam 58 and the bore of a flange 33 are positioned by the flange 33 in order to carry out abbreviation coincidence. On the other hand, in the direction of a B-B cross section, as shown in drawing 18 , the cam 58 has predetermined path clearance to the flange 33, and is positioned in the direction of a B-B cross section as a result.

[0043] Moreover, since the hole of the flange to a body 59 has path clearance as shown in the direction of an A-A cross section at drawing 28 , a body 59, abbreviation, etc. are in the direction of a B-B cross section in it by carrying out as shown in drawing 18 , and it has a bore diameter (that is, it is the slot prolonged in the direction of an A-A cross section), a flange 33 can be moved no longer in the direction of a B-B cross section in the part of an adjusting cam 52. Therefore, an adjusting cam 52 is uniquely regulated in the direction of an A-A cross section by the cam 58 in the eccentric center position in the location within a flat surface perpendicular to the optical axis of the projection system.

[0044] Next, an adjusting cam 32 is explained using drawing 29 and drawing 19 . The hole prepared inside is inserted in the support pin 35, and an adjusting cam 32 is held free [rotation].

[0045] On the other hand, although the cam 38 prepared in the periphery of an adjusting cam 32 is formed in the location which carried out eccentricity to the center of rotation of an adjusting cam 32, it contacts the inside side of a flange 33. That is, a cam 38 and the flange 33 of each other are not positioned.

[0046] Furthermore, a cam 37 is formed so that eccentricity may be carried out in the direction which is different in the above-mentioned cam 38 to the center of rotation of an adjusting cam 32, and in the direction of a C-C cross section, as shown in drawing 19 , in order that the outer diameter of a cam 37 and the bore of a flange 33 may carry out abbreviation coincidence, it is positioned by the flange 33. On the other hand, in the direction of an A-A cross section, as shown in drawing 29 , the cam 37 has predetermined path clearance to the flange 33, is positioned in the direction of a C-C cross section as a result, and is positioned in the direction of an A-A cross section.

[0047] Moreover, the hole of the flange to a body 59 has predetermined path clearance. Therefore, as for an adjusting cam 32, it is uniquely regulated within a flat surface perpendicular to the optical axis of the projection system especially in the direction of a C-C cross section by the cam 37 in the eccentric center position.

[0048] Therefore, as described above, the location of the flange 33 to a plate 31 becomes settled uniquely by the cam 58 of an adjusting cam 52, and the cam 37 of an adjusting cam 32.

[0049] Moreover, since adjusting cams 32 and 52 can be constituted from same components according

to the gestalt of this operation as described above, there is the cost reduction effectiveness. Of course, naturally, the same operation effectiveness can be mutually acquired fundamentally also by another geometry component.

[0050] Next, the contents of adjustment of the projection system are explained in full detail by drawing 20 – drawing 24 .

[0051] Drawing 20 shows the location of light where it was projected on the screen 41. To the screen 41 installed in the display 40, when the display optical unit 3 has been arranged at the position, a raster 43 is irradiated by the location shown with a broken line. That is, a raster 43 is irradiated by the four directions of a screen 41 with a desired margin.

[0052] Next, the relation between an adjusting cam 52 and a raster is explained using drawing 21 and drawing 22 . If drawing 21 shows the condition of having rotated the adjusting cam 52 from the condition which showed by drawing 17 and sets the amount of eccentricity to the center of rotation of the adjusting cam 52 of a cam 58 to L, only max L can move a flange 33 to a drawing top longitudinal direction to a plate 31 by rotation of an adjusting cam 52. Therefore, only L can move the projection system 19 fixed to the flange 33 to a longitudinal direction. As shown in drawing 22 , when the raster 44 is shifted rightward to the screen 41 by this, rotation of an adjusting cam 52 can adjust the location of a raster 44 in a right location.

[0053] Next, the relation between an adjusting cam 32 and a raster is explained using drawing 23 and drawing 24 . If drawing 23 shows the condition of having rotated the adjusting cam 32 from the condition which showed by drawing 17 and sets the amount of eccentricity to the center of rotation of the adjusting cam 32 of a cam 37 to L1, in the location of an adjusting cam 32, only maximum L 1 can move a flange 33 to drawing very best down one to a plate 31 by rotation of an adjusting cam 32. Therefore, only L1 / 2 of abbreviation one half can move the projection system 19 fixed to the flange 33 in the vertical direction. As shown in drawing 24 , when the raster 45 is shifted upward to the screen 41 by this, rotation of an adjusting cam 32 can adjust the location of a raster 45 in a right location.

[0054] Therefore, the adjustment which combines rotation of the above-mentioned adjusting cams 32 and 52 can adjust the location of the projection system 19 in the location of the arbitration of the upper and lower sides and a longitudinal direction.

[0055] The above adjustment devices of the projection system of the ability to omit or simplify are natural if the location of the projection system 19 to a display device 18 is maintainable in the precision of components.

[0056] Next, the fixed approach to the pedestal 30 of the substrate (a sign 53 is attached by drawing 25 and drawing 27) in which a display device 18 and this are carried by drawing 25 thru/or drawing 27 is described.

[0057] Drawing 26 is the attachment member 50 of a display device 18. The center serves as a hole for attaching a display device 18, and the hole or tapped hole for immobilization is established in a long side side. The tapped hole 60 for a hole 51 to fix the attachment member 50 to a pedestal 30 according to **** etc. is for fixing to this attachment member 50 the substrate 53 in which a display device 18 is carried.

[0058] By considering as an ingredient with a property equivalent to an expansion coefficient [as opposed to the heat of a substrate 53 for the attachment member 50], even if the environment of equipment, for example, temperature etc., changes, it can prevent or reduce that the relative physical relationship of a substrate 53 and the attachment member 50 changes. There is much what the high density assembly of a substrate progresses in recent years, and has a multilayer circuit pattern. With the gestalt of this operation, the 12 layer substrate (1.58mm in thickness) of glass epoxy resins is used as a multilayer substrate. Since the laminating of the glass epoxy resin which is the copper and the base material which form a pattern is carried out by turns, the coefficient of thermal expansion of the 12 layer substrate of glass epoxy resins is an about 13 ppm [/degree C] outline between the coefficients of thermal expansion of copper and a glass epoxy resin, and is using the quality of the material of the

attachment member 50 as the iron which is about 12 ppm/degree C almost equal to the coefficient of thermal expansion of a glass epoxy resin multilayer substrate with the gestalt of this operation. Moreover, the things of the quality of the material of an attachment member are [that what is necessary is just what is not limited to iron and has an expansion coefficient to heat equivalent to a substrate] natural. Moreover, a substrate 53 is a member which thickness is a very thin configuration and generally has predetermined flexibility in the thickness direction to a dimension in every direction.

[0059] Drawing 27 shows the condition of having ****ed the substrate 53 to the attachment member 50, and having fixed to it by 54. a place [where the location fixed with a screw thread 54 separated from the location where the display device 18 on a substrate 53 is arranged], and drawing top — a **** [one half / abbreviation] — and it is prepared in the location which can hold the weight of a substrate enough. With the gestalt of this operation, since a substrate 53 is a rectangle, in order to carry out fixed maintenance of this, it is prepared in the location which is a direction along a rectangular long side, and is distant from a display device 18 enough at four places.

[0060] A substrate 53 does not have most things which unnecessary stress generates into the part to which the expansion coefficient to heat ****ed by the temperature change etc., and was mutually fixed by 54 as mentioned above for the abbreviation EQC, although the abbreviation upper half is ****ed and it is fixed to the attachment member 50 by 54.

[0061] Moreover, although there is no part which ****s and carries out the stop of the substrate 53 to the attachment member 50 in near in which a display device 18 is carried, the relative physical relationship over the attachment member 50 of a display device 18 of not being influenced by temperature is natural.

[0062] On the other hand, naturally **** 54 can prepare the location and number alternatively suitably with the configuration and magnitude of a substrate.

[0063] Furthermore, the gage pin 61 for performing positioning with a pedestal 30 to a display device 18 correctly is formed in two places.

[0064] Drawing 25 is the bottom view of the display optical unit 3 showing the condition that the display device 18 is being fixed to the pedestal 30 with the substrate 53 and the attachment member 50. A display device 18 is positioned by the pedestal 30 with the gage pin 61 shown in drawing 27 , is ****ed from the inferior-surface-of-tongue side, and is fixed by 56.

[0065] Here, the display device 18 of the geometry is small, and since the base material has the ceramic or the common plastic as mentioned above, the absolute value of the dimensional change by the temperature change is very small [a display device]. Therefore, it becomes settled uniquely, without the location to the pedestal 30 of a display device 18 changing with above-mentioned positioning structures to environmental variations, such as temperature.

[0066] By the way, the attachment member 50 is ****ed and is fixed to a pedestal 30 by 62. Since this **** 62 is formed in the location close to the display device 18 on a substrate 53 even if there was a difference among few expansion coefficients in the metaphor substrate 53 and the attachment member 50, the dimensional change by the temperature of a substrate 53 etc. can be small performed to the level which does not affect the location to the pedestal 30 of a display device 18.

[0067] The **** 56 which fixes a display device 18 to a pedestal 30 does not need to generate the clamping force beyond the need, therefore seems moreover, not to damage the base material of a display device 18 etc., since the load applied to the substrate 53 whole according to this **** 62 can be received.

[0068] Moreover, since it is being fixed to the pedestal 30 by **** 62 even if the excessive moment joins a substrate 53 or the attachment member 50, the location to the pedestal 30 of a display device 18 is not almost affected.

[0069] And as mentioned above, by the shape of sheet metal, in the thickness direction, since a substrate 53 is a member which has predetermined flexibility, it does not apply stress [**** / un-] to a display device 18 with the flatness of a substrate 53, or the dimensional accuracy of the attachment

member 50.

[0070]

[Effect of the Invention] according to this invention, the display using the display optical unit and it which are compatible to an environmental variation in reservation of the location precision over the optical system of a display device and maintenance of the dependability by relaxation of the stress to a display device can be offered as mentioned above.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the front view showing the example of an appearance of the display as a gestalt of operation of this invention.

[Drawing 2] It is the plan showing the example of an appearance of the display as a gestalt of operation of this invention.

[Drawing 3] It is the side elevation showing the example of an appearance of the display as a gestalt of operation of this invention.

[Drawing 4] It is the front view showing the display optical unit of the display as a gestalt of operation of this invention.

[Drawing 5] It is the plan showing the display optical unit of the display as a gestalt of operation of this invention.

[Drawing 6] It is the side elevation showing the display optical unit of the display as a gestalt of operation of this invention.

[Drawing 7] it is the front view showing the example of an appearance of the display as a gestalt of operation of this invention, and an internal display optical unit is shown — it is a fracture Fig. a part.

[Drawing 8] it is the front view showing the example of an appearance of the display as a gestalt of operation of this invention, and an internal display optical unit is shown — it is a fracture Fig. a part.

[Drawing 9] it is the front view showing the example of an appearance of the display as a gestalt of operation of this invention, and an internal display optical unit is shown — it is a fracture Fig. a part.

[Drawing 10] It is the front view showing the arrangement relation of the optic of the display optical unit as a gestalt of operation of this invention.

[Drawing 11] It is the plan showing the arrangement relation of the optic of the display optical unit as a gestalt of operation of this invention.

[Drawing 12] It is the side elevation showing the arrangement relation of the optic of the display optical unit as a gestalt of operation of this invention.

[Drawing 13] It is the front view showing the display optical unit as a gestalt of operation of this invention.

[Drawing 14] It is the plan showing the display optical unit as a gestalt of operation of this invention.

[Drawing 15] it is the front view showing the display device and projection system as a gestalt of operation of this invention, and internal assembly and an internal adjustment device are shown — it is a fracture Fig. a part.
[Drawing 16] It is the decomposition perspective view showing the projection system as a gestalt of operation of this invention, and the assembly of an adjustment device.
[Drawing 17] It is the plan showing the adjustment device as a gestalt of operation of this invention.
[Drawing 18] it is the side elevation showing the adjustment device as a gestalt of operation of this invention, and adjustment actuation is shown — it is a fracture Fig. a part.
[Drawing 19] it is the side elevation showing the adjustment device as a gestalt of operation of this invention, and adjustment actuation is shown — it is a fracture Fig. a part.
[Drawing 20] It is the front view showing the projection location to the screen as a gestalt of operation of this invention.
[Drawing 21] It is the plan showing the adjustment device as a gestalt of operation of this invention.
[Drawing 22] It is the front view showing the projection location to the screen as a gestalt of operation of this invention.
[Drawing 23] It is the plan showing the adjustment device as a gestalt of operation of this invention.
[Drawing 24] It is the front view showing the projection location to the screen as a gestalt of operation of this invention.
[Drawing 25] It is the bottom view of a display optical unit showing the attachment condition to the pedestal of the display device as a gestalt of operation of this invention.
[Drawing 26] It is the perspective view showing the attachment member of the display device as a gestalt of operation of this invention.
[Drawing 27] It is the perspective view showing the condition of having attached the display device in the attachment member as a gestalt of operation of this invention.
[Drawing 28] it is the side elevation showing the adjustment device as a gestalt of operation of this invention, and adjustment actuation is shown — it is a fracture Fig. a part.
[Drawing 29] it is the side elevation showing the adjustment device as a gestalt of operation of this invention, and adjustment actuation is shown — it is a fracture Fig. a part.
[Description of Notations]
1 [— Reflective mirror,] — A case, 2 — A screen, 3 — A display optical unit, 4 5 [— Display device,] — 8 A light source system, 16 — A reflective mirror, 9 — An illumination system, 18 19 [— 32 A plate, 52 / — Adjusting cam,] — The projection system, 20 — A display, 30 — A pedestal, 31 33 [— Cam,] — A flange, 34 — 35 A lens-barrel, 55 — A support pin, 37, 38, 57, 58 40 [— An attachment member, 51 / — A hole, 53 / — A substrate, 54 / — It ****s and is 60. / — A tapped hole, 61 / — 56 A gage pin, 62 / — ****.] — A display, 41 — A screen, 43, 44, 45 — A raster, 50

[Translation done.]